A. Site Work

The design shall comply with the standards listed in Table 7-1, as well as satisfy the following general criteria:

1. Layout and Drainage

Positive drainage shall be provided to eliminate ponding on grassy areas and on paved surfaces such as the parking lot, entry area, terraces, patios and courtyards.

2. Paving

The public parking lot shall be adjacent to the public building entrance. Paving materials shall be aphaltic. Paths leading from the parking lot to the building entrance shall be paved and accessible to the handicapped. Service vehicles may use the parking access road, but shall be routed away from public parking areas. A delivery and loading area servicing the loading dock, service entrance and garbage dumpsters shall provide adequate space for trucks to turn around and back up to the building. At least two parking spaces for maintenance vehicles must also be provided in the service lot.

3. Landscaping

The siting of the overall facility, layout of the interior spaces, and positioning of patios and terraces shall take advantage of natural growth and desirable views. Tree roots, overhanging branches, and creeping vines may give rise to maintenance problems and hence shall be avoided. Landscape plantings may be used to create a defined outdoor play area, control external circulation, shade walls, windows and roofs to reduce energy consumption, screen objectionable views, improve the appearance of the building, highlight the main entrance, control sun and winds, and/or discourage vandalism. Plant materials shall be appropriate to the climate and terrain and require minimal maintenance.

4. Outdoor Activity Spaces

Covered outdoor spaces shall be considered in climates where the temperature, humidity and wind conditions allow comfortable use at least 100 days of the year. The comfort index shall be figured in the range of between 95°F/45% relative humidity and 65°F/ 75% relative humidity with wind velocity measuring 10 mph or less.

B. Structure

The design shall comply with the standards listed in Tables 7-2 and 7-3. Also, the following general criteria shall be considered in the design:

1. Foundation

The foundation shall be site specific and shall be designed upon known geotechnical considerations, by an engineer knowledgeable of the local conditions.

2. Superstructure

Superstructure framing shall provide clear spans as required for the play areas. Pre-engineered components should be utilized for superstructure framing where feasible.

3. Materials

Climate conditions, high humidity, industrial atmosphere, salt water exposure, or other adverse conditions should be considered when selecting the following:

- ❑ Type of Cement used in Concrete
- ❑ Concrete Cover on Reinforcing Steel in Concrete Membrane
- ❑ Coatings on Structural Members
- ❑ Expansion Joints
- ❑ Level of Corrosion Protection
- ❑ Structural Systems

4. Framing

The framing system shall provide the clear spans required for the multi-purpose area. The facility may be framed with pre-engineered structural components, if this is both cost effective and functional. The advantages of using pre-engineered components include:

- ❑ Low cost and economical construction in uniform application
- ❑ Rapid delivery and rapid fabrication in continental U.S.
- ❑ Integration of trades
- ❑ Overall, a lighter form of construction with lower foundation costs

The Disadvantages are:

- ❑ Possible problems of supply and delivery overseas
- ❑ Some inflexibility in layout and design (deviation from standard modules and applications negates cost advantages)
- ❑ Inadequate corrosion protection, weather tightness and resistance to uplift windloads in extreme climates

Typical bay dimensions are:

- ❑ Longitudinal spacing- 20’-0”, 25’-0” (6.1m, 7.6m)
- ❑ Clear span, standard- 40’-0”, 50’-0”, 60’-0” (12.2m, 15.2m, 18.3m
- ❑ Clear span, long- 70’-0”, 80’-0”, 90’-0”, 100’-0” (21.3m, 24.4m, 27.4m, 30.5m)

Note: Generally, a minimum of three bays in length is required for stability.

C. Building Systems

The architectural, mechanical, electrical, and environmental systems shall comply with standards listed in AFI-32-1023 and MIL-HDBK 1190, Tables 702, 7-4, 7-5 and 7-6, as well as satisfy the following general criteria:

1. Energy Budget

The building energy consumption shall not exceed the energy amounts in Table 4-1 based on 12 hours per day, 5 days per week. This information is based upon the Department of Energy building categories and weather zones.

2. Solar Applications

a. Normal passive solar applications shall be considered in the design, including building shape and orientation, zoning of interior space for heating and lighting needs, protected entrances, window locations and treatments, shading devices, insulation and overhangs. Movable night insulation shall be considered for all windows to control heat gain or loss, especially where the heating degree days exceed 5000.

b. Unique passive solar applications that are not part of normal design, shall be employed only where they are proven to be cost effective and will provide at least 25 percent of the required space heating or cooling, or 35 percent of the lighting required of the facility. Insulation at the base must exceed an annual daily average of 300 Langleys before passive solar heating can be considered or 200 Langleys before unique passive solar daylighting can be considered.

c. Active solar applications shall be provided only where they are proven to be cost effective by the base or MAJCOM through solar assessment techniques discussed in current Air Force directives. They must also provide a minimum of 25 percent of the required space heating or cooling and 35 percent of the domestic water heating on a yearly basis.

3. Natural Daylighting

Windows are advised for all spaces except storage rooms, toilet rooms, and mechanical rooms. Exterior enclosed blinds, light shelves, screens and translucent glazing materials shall be used to control reflected glare and to diffuse direct sunlight.

Table 4-1: Energy Budgets

	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7
CDD	<2000	<2000	<2000	<2000	<2000	>2000	>2000
HDD	>7000	5500-7000	4000-5000	2000-4000	0-2000	0-2000	2000-4000
Budgets*	78,000	72,000	60,000	48,000	48,000	54,000	60,000
CDD = annual cooling degree days (base 65_F)						*energy consumer in BTU/ft.^{2}/yr.	
HDD = annual heating degree days (base 65_F)							

4. Electrical Systems

The design shall comply with current standards as well as satisfy the following general criteria:

a. Artificial illumination. All artificial lighting fixtures shall be capable of independent switching, and shall be located to allow for relamping from the floor with the aid of portable ladders. Refer to Chapter 5, Specific Space Criteria, for light fixture requirements and recommended types.

b. Communications. A centrally controlled public address and two-way communication system is required for the facility.

- ❑ at least one public address speaker shall be provided in each room except storage and mechanical rooms. A speaker shall be provided for each 800 sq. ft. (74.3 m 2) of net floor area.
- ❑ at least one two-way communication station shall be provided at the entrance of every activity, support, and staff spaces
- ❑ at least one telephone outlet shall be provided in each staff office. A public telephone shall be located in or adjacent to the lobby.

c. Receptacles - in the Youth Center, receptacles shall be located above counter height.

5. Conservation/Environmental Measures

Designers should consider the following energy conservation recommendations when planning systems and choosing equipment:

a. Incorporate the lowest non-ozone depleting refrigerants in design of cooling systems.

b. Refrain from over-designing systems to maintain energy and cost efficiency.

c. Install variable speed drives on chilled and hot water equipment when economically favorable.

d. Integrate automatic controls on HVAC equipment to de-energize when not required.

e. Install heat pumps versus resistive heating.

f. Provide air dampers with low leakage.

g. Consider the building operation and weather conditions and provide a system that utilizes those conditions most effectively (e.g., evaporative cooling in dry weather conditions or using a heat wheel to preheat make-up air in colder climates).

h. Use gas-fired furnaces and other equipment that is rated over 90 percent efficient when economically favorable.

6. HVAC Systems

The HVAC system shall be designed and sized base on weather data contained in AFM 88-29, ENGINEERING WEATHER DATA. Use local or regional weather data only when data are not available from a nearby military base.

The inside design temperature shall not exceed 78_ F or be less than 75_ F in the cooling mode. The relative humidity shall be no less than 50 percent, or equal to the outside air dewpoint design temperature. In heating modes, the design temperature shall be 70_ F. Air conditioning is allowed in all facilities when purchased entirely with non-appropriated funds. Mechanical rooms shall not be air conditioned regardless of climatic conditions. Toilet rooms, custodial rooms, and corridors shall be maintained under the same conditions as the rest of the facility, however, transferred air from other spaces should be used for heating/cooling when possible. Toilet rooms shall utilize mechanical exhaust directly to the outdoors at a minimum rate of 10 air changes per hour. Pipes located in non-heated spaces shall be provided with minimum heating or heat tracing to prevent freezing.

The facility shall be separated into various zones based on the exposure, hours of operation, large heating/cooling loads, occupancy, etc., in order to maximize comfort, efficiency, economical operation, and energy conservation for the HVAC system. In addition, the designer shall use the minimum performances listed in the latest ASHRAE Energy Efficient Design Standard (ASHRAE 90.1-1989) when selecting equipment. The HVAC control system for the facility shall also utilize the simplest and most effective method while considering the control of space conditions, monitoring and maintaining HVAC systems, and operation costs.

The facility shall be supplied with the required ventilation and outside air as dictated per ASHRAE Standard 62-1989. At a minimum, the requirements of ASHRAE Standard 20.1 for ventilation and minimum outside air shall be met. Motors shall be selected such that operation of the equipment shall be through its total range without exceeding the motor capacity. In addition, motors greater than ½ horsepower shall use three-phase power.

7. Acoustical

The facility shall be designed with the acoustical properties outlined in Table 4-2. The multi-purpose space will require additional consideration for noise suppression. Acoustical ballasts or banners should be studied. The walls should utilize sound blocks or panels.

8. Plumbing

a. The pressure of the municipal water service shall be verified to meet the requirements of the facility. Analysis and treatment, if necessary, of the water service shall be provided to assure compliance with all applicable codes. In addition, all domestic water piping, fittings, fixtures, and solder used for connections shall be lead-free to comply with EPA and local codes.

b. Domestic water heaters shall be of the high-efficiency type and shall provide hot water to lavatories, dirty rooms, and service sinks at a temperature no greater than 120_ F. Water heaters shall be located near the area served and long hot water runs should be avoided, otherwise a hot-water re-circulation system shall be installed.

c. The plumbing designer shall comply with the following water conservation guidelines unless more restrictive standards are specified by codes:
   (1) A lavatory, kitchen faucet, or showerhead shall have a maximum domestic water demand of 2.5 gal/min when measured at a flowing water pressure of 80 psi.
   (2) The maximum water use for the following fixtures shall be as indicated in Table 4-3.

d. Horizontal drainage piping under 4 inches shall be installed at a uniform pitch not less than 1/4 inch per foot. Drainage piping 4 inches and over shall be installed at a uniform pitch not less than 1/8 inch per foot. Install three inch diameter floor drains as applicable, but not limited to toilet rooms with three or more fixtures, kitchens, and mechanical rooms. Provide floor cleanouts as required by the National Standard Plumbing Code.

e. Piping systems shall be supplied with adequate supports, vibration isolation, and allowance for expansion or contraction. In addition, the piping shall be vented and sloped as required. Each piece of equipment or fixture shall be supplied with isolation valves located in such a manner as to not interfere with the removal or maintenance of that equipment. Drain valves shall also be installed at low points near each shut-off.

9. Fire Protection

A sprinkler system shall be installed where required by local codes. The sprinkler system shall be designed and installed in accordance with NFPA 13. A dry system shall be installed in areas subject to freezing temperatures. A retard device shall be provided with each flow switch to prevent a false alarm in the case of a power surge.

Table 4-2: Acoustical Requirements

	Maximum Expected Generated Sound Level	Ambient Noise	Sound Insulation	Sound Absorption
	PWL[1]	PNC[2]	STC[3]	NCR[4]
Administrative Spaces	40	35-40	40-45	.30-.40
Activity Spaces	50	30-35	50	.60-.80
Development Room	40	30-35	45-50	.30-.40
Pre-Teen Room	70	25-30	_	
Teen Room	70	25-30	_	
Snack/Vending Area	70	35-40	35-60	.60-.80
Music Practice Room	60	25-30	55	.60-.80
Multipurpose Room	80	20-30	_	

[1] PWL = Magnitude of Sound
[2] PNC = Preferred Noise Criteria
[3] STC = Sound Transmission Class
(all of above measured in decibels)
[4] NCR = Noise Reduction Coefficient

D. Design Development

Once the list of spaces to be placed in the center has been established and the unique needs of each space understood, the overall organization of the building and its site can be addressed. Other than meeting aforementioned design objectives and space criteria, factors affecting the success of a given design include:

1. **Value**
   The design shall result in a complete facility that can be constructed within the project funds and maintained economically
2. **Operating Efficiency**
   The spaces shall be arranged in a coherent whole that allows both effective operation and future expansion.
3. **Consideration of Climate**
   The design shall maximize the advantages and minimize the disadvantages of the environmental conditions of the base.

E. Project Cost

The design shall be guided by considerations that reduce project cost. The following basic decisions shall influence the design only to the extent that they result in savings in construction and operating costs and are permitted by other project requirements.

1. **Floor Area**
   A compact plan can minimize floor areas for corridors, walls and structure. Also, areas can be reduced by using multipurpose spaces that will efficiently allow two or more activities at the same time or by sharing time.
2. **Building Massing**
   Structural, building enclosure and mechanical costs can be reduced with a compact building volume. Simple roof configuration that results in high ceilings over the multi-purpose and lobby space and standard clearances elsewhere contributes the most to a cost-effective volume.

Table 4-3: Maximum Water Use

FIXTURE	GALLONS OF WATER/FLUSH
Gravity tank-type toilets	1.6
Flush-meter tank toilets	1.6
Electromechanical hydraulic toilets	1.6
Flushometer valve toilets	1.6
Urinals	1.0

3. Simplified Construction

The following means to simplify construction are encouraged wherever feasible.

a. Use of pre-engineered building systems where they are locally available and where they can be supplied and maintained economically.
b. Use of familiar building assemblies and forms that do not require a specially qualified labor force or special construction equipment for installation.
c. Consolidation of those spaces that require similar mechanical services in one area, to limit piping and ducts.
d. Use of materials that are locally available
e. Minimize the variety of materials and trades used.

4. Energy Management

Applying the principles of passive solar design can reduce operating costs. The effective use of insulation shall be optimized using a life cycle cost study. Fuels that can be provided economically and reliably for the life of the facility shall be selected. An HVAC system with economizing cycles and facility-wide monitoring capacity is required.